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Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,475,755**, on July 23, 2004, by **SU LIN CO** and **GEOFFREY ONG-HAY CO**, for "Plastic Bag with Integral Tie Strip".

Agent certificateur/Certifying Officer

February 14, 2005
Date

Canada

(CIPO 68)
31-03-04

OPIC CIPO

Abstract

This invention relates to a plastic bag product having a receptacle and a tie strip attached to the bag. The receptacle can be bottom-welded and made of a flexible plastic material, with an opening at a top of the receptacle and a bottom line weld that closes a bottom of the receptacle. The tie strip is also made of flexible plastic material and has a bottom end secured to the receptacle by the bottom line weld, a top end secured to the receptacle near the top opening by a top line weld, and perforations extending transversely across the tie strip that enables enough of a top portion of the tie strip to be separated from a bottom portion of the tie strip to enable the top portion of the tie strip to wrap around and close the receptacle opening. Alternatively, the receptacle can be a side-welded bag comprising an opening at a top of the receptacle, left and right sides respectively closed by left and right line welds, and a closed bottom.

Plastic Bag With Integral Tie Strip

Field of the Invention

This invention relates generally to a plastic bag product having a perforated integral tie strip, and a method of manufacturing such a product.

Background of the Invention

The most basic disposable plastic storage bags typically comprise a pair of overlapping plastic sheets closed along a bottom edge and a pair of side edges, or a tubular body welded along one end to form a closed bottom edge. The top edge is left open and can be temporarily closed by a separate closure mechanism such as wire twist ties. However, such closure mechanisms tend to be awkward to apply to the bag, often requiring both hands to handle the closure mechanism. Also, such separate closure mechanisms tend to get separated from the bag product and lost. Examples of such bag products with separate closure mechanisms are disclosed in US patents 3,633,247; 3,662,434; 3664,575; 3,972,469; 3973,610; 3,997,943 and 4,077,562.

Attempts have been made to develop more complex bag products that integrate a closure mechanism into the bag's body. For example, tie elements have been integrated into the body of the bag. An example of such bag products are disclosed in US patent 5,044,775. These bag products require manufacturing processes that are relatively complex and time consuming, and manufacturing machines that are relatively expensive.

It is also known to provide a channel in the bag body to receive a tie element. An example of such a design involves producing a hem on the bag that receives a tie element threaded therethrough. Such a hem requires additional bag material and manufacturing steps, thereby resulting in a more expensive and complex product that is relatively time consuming to manufacture. Examples of such bag

products are disclosed in US patents 3,029,853 and 3,506,048.

In yet another bag product design, the tie element is attached to the bag product by an adhesive, and can be separated from the bag for use in tying closed the bag opening. Such adhesives tend to add significant expense to the manufacture of the bag product. Also, when the tie element is separated from the bag, the user typically uses both hands to tie the tie element around the bag opening, which can be awkward as he must also hold the bag at the same time. US patents 3,412,926 and 3,974,960 are examples of such bag products.

It is therefore an object to provide a closable bag product that is an improvement over known closable bag products and a method of manufacturing same.

Summary of the Invention

According to one aspect of the invention, there is provided a bag product comprising a bottom-welded receptacle and a tie strip attached to the receptacle and used to close an opening of the receptacle. The receptacle is made of a flexible plastic material and comprises an opening at a top of the receptacle and a bottom line weld that closes a bottom of the receptacle. The tie strip is made of flexible plastic material and has a bottom end secured to the receptacle by the bottom line weld, a top end secured to the receptacle near the opening by a top line weld, and perforations extending transversely across the tie strip that enables enough of a top portion of the tie strip to be separated from a bottom portion of the tie strip to enable the top portion of the tie strip to wrap around and close the receptacle opening.

Such a bag product can be disposable and is particularly useful for storing items such as trash. Because the tie strip is attached to the receptacle, there is no risk of losing the tie strip. Also, because one end of the tie strip remains attached near to the opening of the receptacle and is exceptionally long when the tie strip is separated at the perforations, wrapping the tie strip around the receptacle

opening is particularly convenient. Furthermore, because the bottom weld line closes the bottom of the receptacle as well as attaches the bottom end of the tie strip, manufacture of the bag product is made more efficient.

The top line weld can be a weld selected from the group of a continuous line weld, intermittent line weld and spaced spot welds. Also, the tie strip can be arranged substantially perpendicular to the receptacle opening.

The receptacle can be an extruded tubular film which is closed at the bottom by the bottom line weld. Alternatively, the receptacle can be a plastic coated material. In particular, the tubular film can comprise first and second overlapping sheets joined together by a pair of side edges and closed at the bottom by the bottom line weld. In such case, the top end of the tie strip can be welded to the first sheet by the top line weld. The top line weld can secure the tie strip to the first sheet without securing the first and second sheets together. Or, the top line weld can secure the tie strip to the first sheet, as well as securing the first and second sheets together.

According to another aspect of the invention, there is provided a bag product comprising a side-welded receptacle and a tie strip attached to the receptacle and used to close an opening of the receptacle. The receptacle is made of a flexible plastic material and comprises an opening at a top of the receptacle, left and right sides respectively closed by left and right line welds, and a closed bottom. The tie strip is made of flexible plastic material and has a left end secured to the receptacle by the left line weld, a right end secured to the receptacle by the right line weld, and perforations extending transversely across the tie strip and between the secured ends such that the tie strip can be separated into two portions each having a free end and a secured end, and wherein at least one of the tie strip portions can wrap around and close the receptacle opening.

The receptacle can be a folded plastic film having a fold line that defines the closed bottom, and having side edges closed by the left and right line welds, and

a pair of top edges that define the receptacle opening. The length of the tie strip can extend substantially parallel to and close to the bag opening. A plurality of spot welds can be spaced along the length of the tie strip and serve to secure the tie strip to a surface of the receptacle. This reduces the tendency for the tie strip to sag relative to the receptacle surface.

The perforations can be located near one of the ends of the tie strip such that when the tie strip is separated, one of the tie strip portions is substantially longer than the other portion, making it easier to wrap the tie strip portion around the receptacle opening.

Brief Description of Drawings

Figure 1(a) is a schematic perspective view of a roll of flattened tubular plastic sheet and Figure 1(b) a roll of flattened tubular plastic sheet with one longitudinal edge cut open.

Figure 2 is a schematic side view of a prior art plastic bag manufacturing line.

Figure 3 is a schematic side view of a plastic bag manufacturing line that joins a tie strip to a receptacle sheet according to one embodiment of the invention.

Figure 4 is a schematic plan view of a welding and cutting assembly of the plastic bag manufacturing line.

Figures 5(a) to (c) are schematic front views of different embodiments of a plastic bag with integral tie strip product as manufactured by the manufacturing line shown in Figure 3, namely bottom-welded bags with a tie strip sealed to the top edge of a receptacle by a continuous line weld (Figure 5(a)), intermittent line welds (Figure 5(b)), and spot welds (Figure 5(c)).

Figures 6(a) to (c) are schematic front views of different embodiments of a plastic bag with integral tie strip product as manufactured by the manufacturing line

shown in Figure 3, namely bottom-welded bags with a tie strip sealed to the top edge of a receptacle by a continuous line weld (Figure 6(a)), intermittent line welds (Figure 6(b)), and spot welds (Figure 6(c)), wherein the welds partially close the top opening of the bag.

Figures 7(a) and (b) are schematic front views of another two embodiments of the invention, namely a side-welded bag with a tie strip sealed to the side edges of a receptacle and to the front of the receptacle (Figure 7(a)), and a side-welded bag with a tie strip sealed to the side edges of the receptacle only (Figure 7(b)).

Figure 8 are schematic front views of steps of filling and securing closed the bag shown in Figure 5(a) by its tie strip.

Figure 9 are schematic front views of steps of filling and securing closed the bag shown in Figure 7(a) by its tie strip.

Detailed Description of Embodiments of the Invention

Figure 1(a) shows a continuous tubular plastic sheet 53 flattened into a plastic strip comprising two overlapping sheets joined by a pair of longitudinally extending side edges with an opening in the direction of the front of the roll 26 A. This form of material is suited for the manufacture of bottom welded bags. Figure 1 (b) shows a continuous tubular plastic film 253 flattened into a plastic strip comprising two overlapping sheets joined by one longitudinal side edge. The other side edge is cut opened longitudinally. The plastic sheet 253 can also be a single layer plastic film folded longitudinally at its centre. The plastic sheet 253 has openings in the front and one side of the roll 26 B. This form of material is suited for the manufacture of side welded bags.

A conventional plastic bag manufacturing line 81 is shown on Fig.2, a roll of plastic tubular film 26A is mounted on an unwind stand (not shown). As the roll unwinds, the plastic sheet 53 is released and threaded through rollers 25 and 50

and continue on to rollers 60 before it is fed into a pair of driven feed rollers 61. The pair of feed rollers 61 controls the length of the bag to be made. During the bag making process the pair of feed rollers 61 pulls the plastic sheet forward by rotating in preset speed and preset number of revolutions. The pair of feed rollers 61 operate in intermittent cycles and is driven by a servo motor (not shown). The preset number of revolutions of the feed rollers 61 dictates the length of the bag. At each bag making cycle when the preset revolutions of the feed rollers are reached, the servo motor applies a brake on the feed rollers 61 so that plastics sheet 53 are always of the same length when fed into a bag forming machine 62.

Inside the bag forming machine 62 is a welding and cutting assembly 64. When brake is applied to the feed rollers61, the welding and cutting assembly is activated and a welding iron 68 applies a transverse weld line and a cutting knife 66 cuts the plastic sheet 53 cleanly across the sheet 53. The transverse weld and the clean cut edge are parallel to each other and closely spaced The transverse weld line defines the bottom weld of the bag and the adjacent cut edge defines the bottom edge of the bag. The plastic sheet 53 on the downstream side of the cutting knife 66 defines the top edge opening of a previously made bag 71. A conveyor 69 conveys the bag 71 to a collection table 72.

The above describes the conventional manufacture of a bottom weld plastic bag on a bag manufacturing line as shown on Fig. 2.

Alternatively, the roll 26 can be the continuous plastic sheet 253, as shown in Fig.1(b). With the plastic sheet 253 as material , the welding and cutting assembly can be modified to simultaneously apply a pair of transverse welds and the cutting knife 66 will cut the plastic sheet 253 cleanly in between the two transverse welds. This produces discrete bags having the openings perpendicular to the manufacturing line, eg in the direction of the cut longitudinal edge of the plastic sheet 253 with the side edges of each bag being defined by adjacent pairs of transverse welds and the bottom edge being define by the

uncut longitudinal edge of the plastic sheet 253. Such bags are known as side welded bags.

According to one embodiment of the invention and referring to Fig. 3, 5, 6, 8, a plastic bag manufacturing line 82 is built and equipped to carry out a process of mass manufacturing plastic bags with integral tie strip 116, each bag 100 comprises a receptacle 110 and a tie strip 116 securely attached to the receptacle 110 that can be use to tightly close the opening 114 of the bag 100, e.g. after the bag has been filled up.

A roll 52 of a continuous plastic tie sheet (tie sheet 55) is installed on an unwind stand. The plastic tie sheet 55 may be single or multi ply or tubular. This tie sheet 55 is much narrower than receptacle sheet 53 and serves as material for the tie strips 116. Manufacture of such tie sheet is well known in the art and is thus not discussed here.

The tie sheet 55 unwinds from roll 52 and passes tension rollers 25 and 50.The tension rollers serves to position the tie sheet 55 generally parallel to and may or may not be centred over receptacle sheet 53. The tie sheet 55 and receptacle sheet 53 are then pulled together into a perforation machine 54 by feed rollers 61. The tie sheet 55 is pulled over a transversely extending plate 56 inside the perforation machine 54, and the receptacle sheet 53 is pulled under the plate 56. A perforator 58 positioned above the plate 56 is lowered onto the tie sheet timed when feed rollers 61 is at brake position, i.e. when both tie sheet and receptacle sheet 53 are at rest and not moving. As a result, a transversely extending perforation line 118 is applied across tie sheet 55 only.

Except when the tie sheet 55 is moving over and the receptacle sheet 53 is moving under the plate 56, the tie sheet 55 is at all times on top of receptacle sheet 53 and the two sheets are always moving forward or stopping together. In this way the length of the receptacle 110 and the length of the tie strip 116 attached to the receptacle 110 are always the same length.

The perforation machine 54 is not fixed. It is constructed to be positionable along the length and across the width of the manufacturing line 82. Any movement of the perforation machine 54 along the length of the bag manufacturing line will alter the centre distance between the perforation blade 58 and the welding iron 68. The centre distance between perforation blade 58 and welding iron 68 defines the location of perforations 118 on the tie strip 116.

After the perforation on the tie strip 116 is made, the feed rollers 61 are activated. The tie sheet 55 and receptacle sheet 53 rejoin and exit the perforation machine 54. The tie and receptacle sheet 53, 55 then go through a series of tension rollers 60 prior to being fed by feed rollers 61 into a bag forming machine 62.

Inside the bag forming machine 62 is the welding and cutting assembly shown in detail in Fig. 4. The welding and cutting assembly 64 comprises three closely spaced, transversely-extending components, namely a cutting knife 66 sandwiched between a pair of welding irons 68, 70. The cutting knife 66 spans the width of the receptacle sheets 53 and is lowered at timed intervals to cut the receptacle sheets 53 into discrete receptacles 110, and the tie sheet 55 into discrete tie strips 116. The upstream welding iron 68 ("bottom-welder") extends the width of the receptacle sheets 53 and applies a line weld ("bottom line weld") transversely across the receptacle 110 and tie strip 116, thereby securing a bottom end of the tie strip 116 to one sheet of the receptacle 110, as well as sealing together the two sheets 53 of the receptacle 110, thereby closing the bottom of the receptacle 110 that is immediately upstream of the cutting knife 66. The downstream welding iron 70 ("tie strip welder") has a width corresponding to the width of the tie sheet 55 and applies sufficient heat to weld a top end of the tie strip 116 to the receptacle sheets 53 along a continuous line weld 120 ("top tie line weld").

Certain properties of the tie strip welder 70 can be controlled such that sufficient heat is applied to secure the tie strip 116 to the top sheet of the receptacle 110, but not secure the top sheet to the bottom sheet, thereby leaving the receptacle

opening 114 open. The properties that can be controlled to effect such a weld include the temperature of the tie strip welder 70, and the amount of force that the tie strip welder 70 contacts the tie strip 116, and the duration of contact between the tie strip welder 70 and the tie strip116.

Alternatively, certain properties of the strip welder 70 can be controlled such that sufficient heat is applied to secure the tie strip 116 to the top sheet of the receptacle 110, and secure the two sheets 53 of the receptacle 110 together at the top tie line weld 120. This may be desirable, for example, to ensure that the tie strip 116 is securely fastened to the receptacle 110. As the length of the top tie line weld 120 is small relative to the overall width of the receptacle opening 114, it has been found that the weld between the two sheets 53 of the receptacle 110 can be broken without causing significant damage to the receptacle 110 and the functionality of the bag remaining intact.

While the embodiment shown in Figure 4 shows the strip welder 70 configured to apply a continuous line weld across the tie sheet 55, the strip welder 70 can be configured to apply different types of top tie welds, such as an intermittent line weld, or a line of spaced spot welds.

Referring now to Figures 5(a) – (c), the bags 100 produced by the aforementioned approach are "bottom-welded" bags 100 having the receptacles 110 formed from a tubular plastic film and sealed along the bottom edge by the bottom line weld 112. The bag 100 also has the tie strip 116 attached longitudinally to the receptacle 110. That is, the tie strip 116 is attached at its bottom end to the bottom edge of the receptacle 110 by the bottom line weld 112, and at a top end to the top edge of the receptacle 110 by the top tie line weld 120. The perforation line 118 is located near the bottom of the tie strip 116 and receptacle 110.

As shown in Figure 5(a), the top line weld 120 is a continuous line weld that was applied with sufficient heat to weld the tie strip 116 to one sheet of the receptacle 110 but not weld the two sheets together. Alternatively, the top line weld can be

an intermittent line weld 122 as shown in Figure 5(b), or a line of spaced spot welds 122 as shown in Figure 5(c).

According to another embodiment of the invention and referring to Figure 6(a), the bag 100 is partially closed at its opening 114 by the top line weld 120. This line weld 120 is a continuous line weld, but is sufficiently short that the two sheets 53 can be separated to reveal the receptacle opening 114 without causing significant damage to the receptacle 110. Alternatively, the top line weld can be an intermittent line weld 122 as shown in Figure 6(b), or a line of spaced spot welds 124 as shown in Figure 6(c).

According to yet another embodiment of the invention and referring to Figures 3, 7 and 9, a plastic bag 200 is manufactured having a side-welded receptacle 210 and a tie strip 216 attached transversely across the top edge of the receptacle 210. The tie strip roll 52 is positioned so that the tie sheet 55 is laid over the receptacle sheets 253 near the cut edge, and the perforator 58 is repositioned accordingly. The welding and cutting assembly 64 is modified so that the tie strip welder 70 is replaced by a duplicate of welding iron 68 that extends transversely across the receptacle sheets 253. The welding and cutting assembly 64 is operated to cut the receptacle sheets 53 into discrete receptacles 210 and the tie sheet 55 into discrete tie strips 216 by the cutting knife 66 and to form the side edges of each receptacle by a continuous line weld applied by each of the welding irons 68, 70, as well as to secure the ends of the tie strip 216 ("left" and "right" ends) to one sheet of the receptacle 210. Optionally, a spot welder (not shown) can be installed inside the bag forming machine to apply spaced spot welds along the length of the tie strip 116.

Each resultant bag 200 as shown in Figure 7(a) comprises the side-welded receptacle 210 having a bottom edge 212 defined by the uncut edge of the receptacle sheets 253, a pair of side edges defined by left and right transverse welds 226, 228, and an opening 214 defined by the cut edge of the receptacle sheets 253. The tie strip 216 is attached transversely across the top of the

receptacle 210. That is, a left end of the tie strip 216 is welded to the receptacle 210 by the left transverse weld 226 and the right end of the tie strip is welded to the receptacle 210 by the right transverse weld 228. A perforation line 218 extends transversely across the tie strip 216 near the right end of the tie strip 216. Optionally, a series of spaced spot welds 230 attach the middle of tie strip 216 to receptacle 210 to maintain the tie strip 216 in place. Figure 7(b) shows the bag 200 without the spot welds.

Referring to Figures 8(a) to (d), the bottom-welded bag 100 is filled with items such as garbage (Figure 8(b)); once filled, the bottom end of tie strip 116 is separated from the receptacle 110 by tearing along the perforated line 118 (Figure 8(c)). Then, the opening 114 is closed and the tie strip 116 is wrapped or encircled around the top of the receptacle 110, and secured with a knot. Similar steps are shown for filling the side-welded bag 200 in Figures 9(a) to (d).

The invention is not to be limited by the embodiment shown in the drawings and described in the description, which is given by way of example and not limitation, but only in accordance with the scope of the appended claims.

What is Claimed is:

1. A bag product comprising:

(a) a bottom-welded receptacle made of a flexible plastic material and comprising an opening at a top of the receptacle and a bottom line weld that closes a bottom of the receptacle; and

(b) a tie strip made of flexible plastic material and having a bottom end secured to the receptacle by the bottom line weld, a top end secured to the receptacle near the top opening by a top line weld, and perforations extending transversely across the tie strip that enables enough of a top portion of the tie strip to be separated from a bottom portion of the tie strip to enable the top portion of the tie strip to wrap around and close the receptacle opening.

2. A bag as claimed in claim 1 wherein the top line weld is a weld selected from the group of a continuous line weld, intermittent line weld and spaced spot welds.

3. A bag as claimed in claim 2 wherein the receptacle is a tubular film closed at the bottom by the bottom line weld.

4. A bag as claimed in claim 3 wherein the tubular film comprises first and second overlapping sheets joined together by a pair of side edges and closed at the bottom by the bottom line weld.

5. A bag as claimed in claim 4 wherein the top end of the tie strip is welded to the first sheet by the top line weld.

6. A bag as claimed in claim 5 wherein the top line weld secures the tie strip to the first sheet without securing the first and second sheets together.

7. A bag as claimed in claim 5 wherein the top line weld secures the tie

strip to the first sheet, as well as securing the first and second sheets partially together.

8. A bag as claimed in claim 1 wherein the tie strip is arranged substantially perpendicular to the receptacle opening.

9. A bag product comprising:

(a) a side-welded receptacle made of a flexible plastic material and comprising an opening at a top of the receptacle, left and right sides respectively closed by left and right line welds, and a closed bottom; and

(b) a tie strip made of flexible plastic material and having a left end secured to the receptacle by the left line weld, a right end secured to the receptacle by the right line weld, and perforations extending transversely across the tie strip and between the secured ends such that the tie strip can be separated into two portions each having a free end and a secured end, and wherein at least one of the tie strip portions can wrap around and close the receptacle opening.

10. A bag product as claimed in claim 9 wherein the receptacle comprises a folded plastic film having a fold line that defines the closed bottom, having side edges closed by the left and right line welds, and having a pair of top edges that define the receptacle opening.

11. A bag product as claimed in claim 9 wherein the perforations are located near one of the ends of the tie strip such that the when the tie strip is separated, one of the tie strip portions is substantially longer than the other portion.

12. A bag product as claimed in claim 9 wherein the length of the tie strip extends substantially parallel to the bag opening.

13. A bag product as claimed in claim 9 further comprising a plurality of spot welds spaced along the length of the tie strip and securing the tie strip to a surface of the receptacle.

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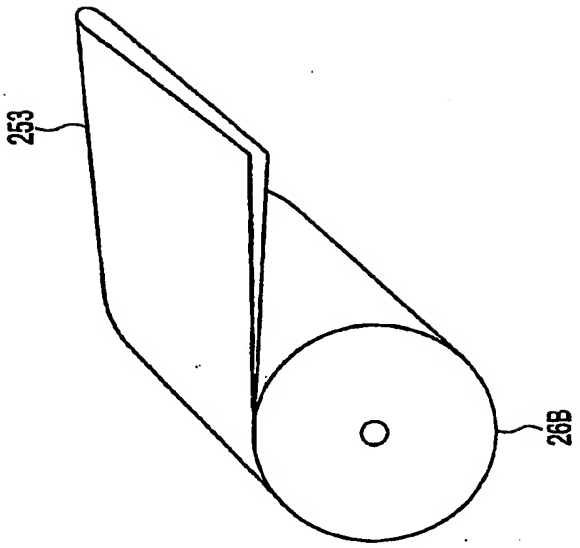

FIG. 1B

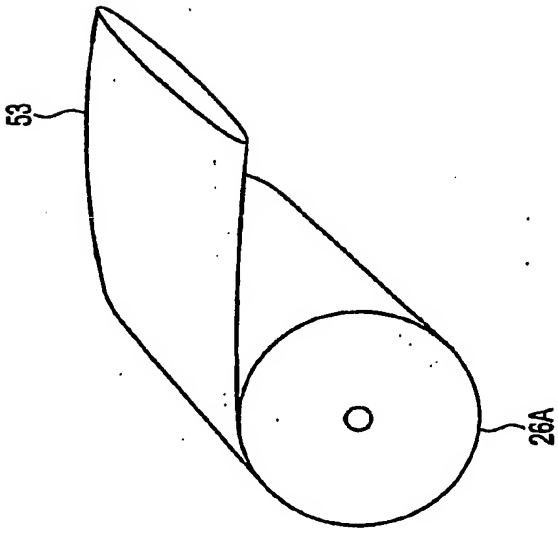

FIG. 1A

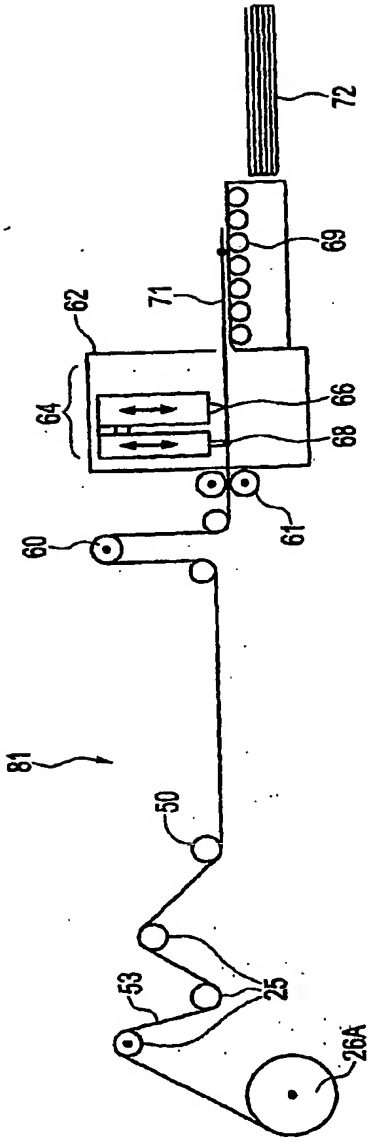

FIG. 2 (PRIOR ART)

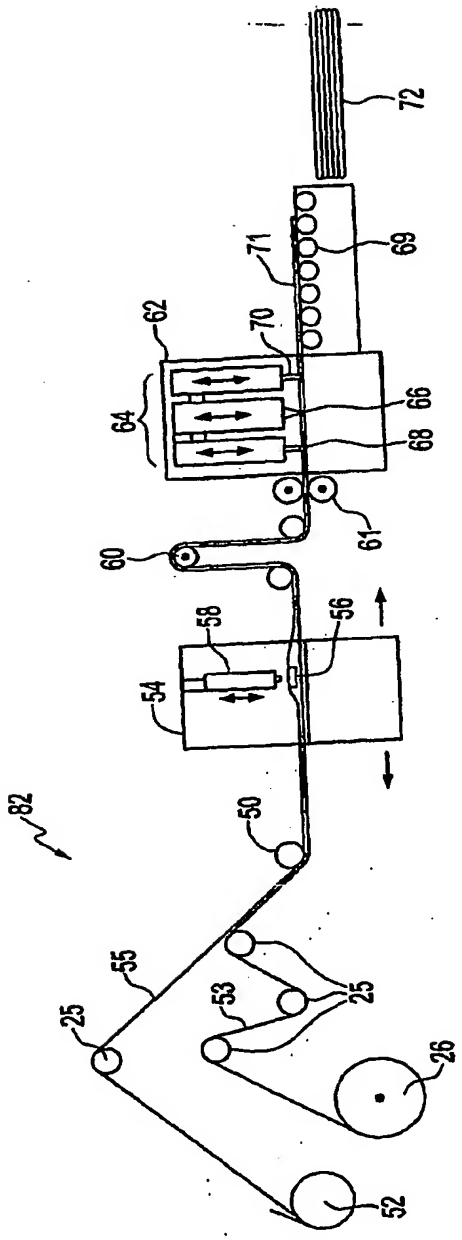

FIG. 3

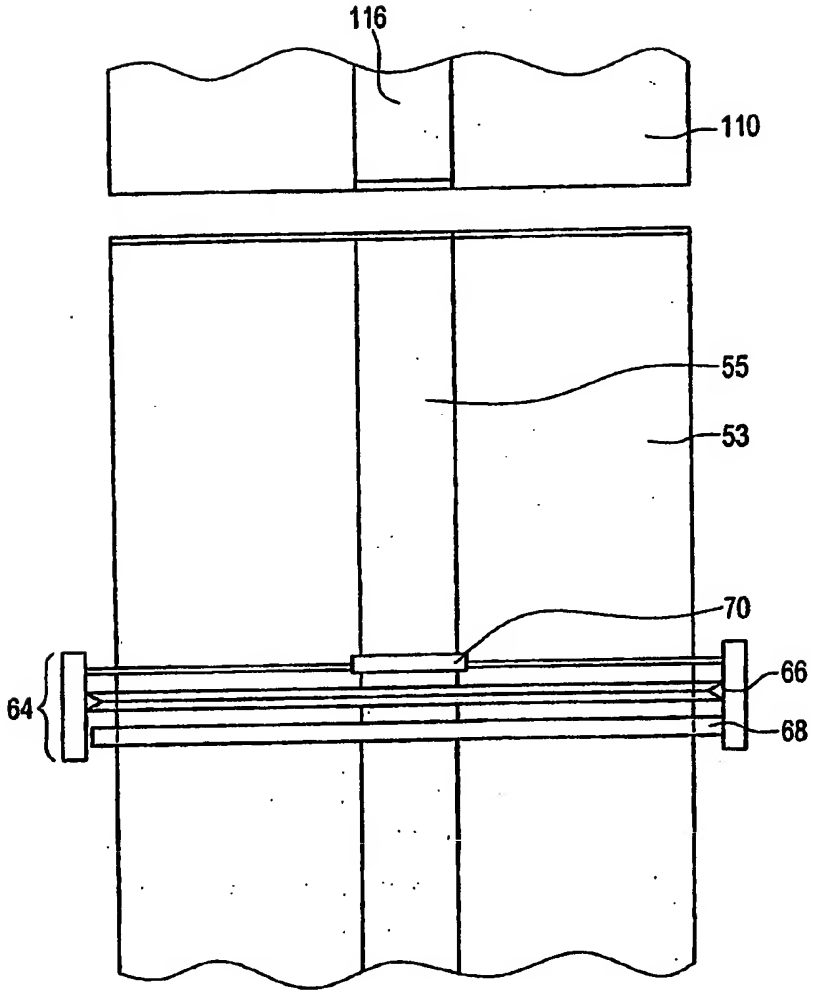

FIG. 4

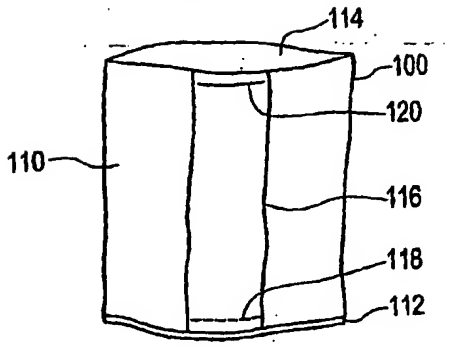

FIG. 5A

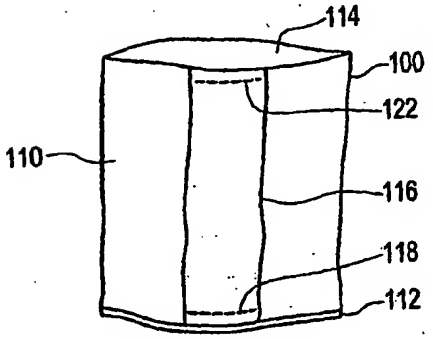

FIG. 5B

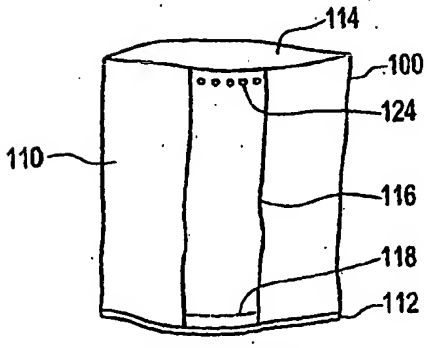

FIG. 5C

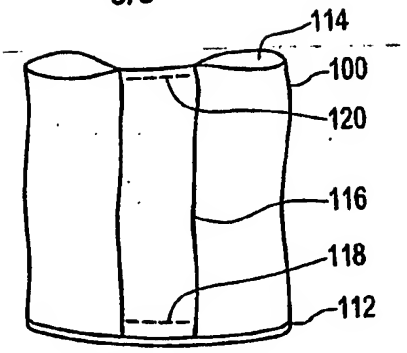

FIG. 6A

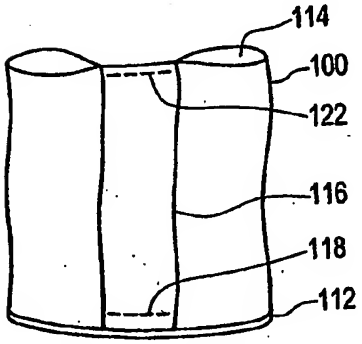

FIG. 6B

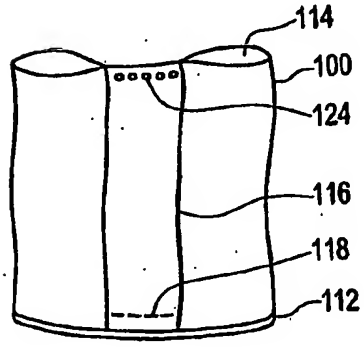

FIG. 6C

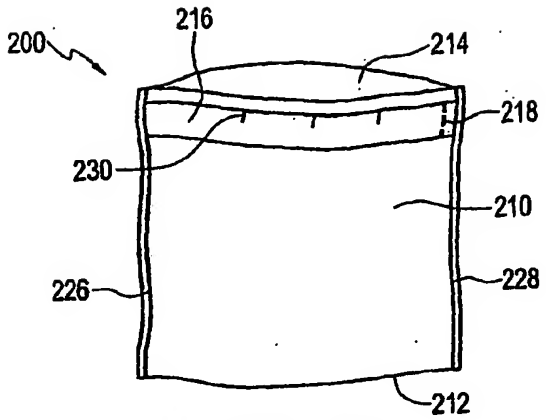

FIG. 7A

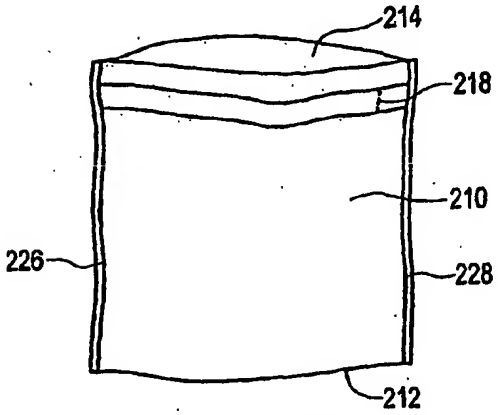

FIG. 7B

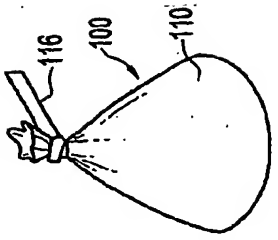

FIG. 8D

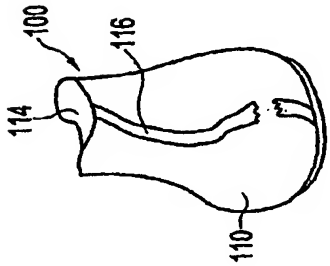

FIG. 8C

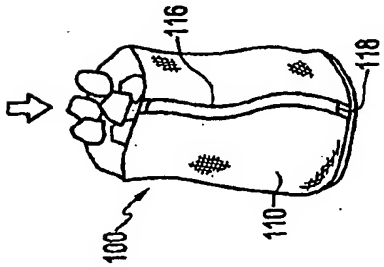

FIG. 8B

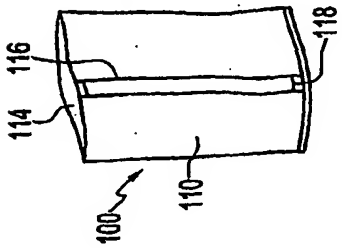

FIG. 8A

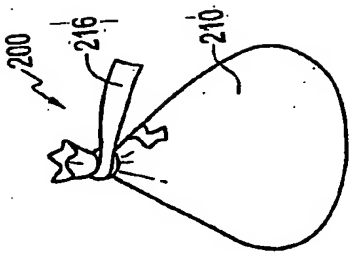

FIG. 9D

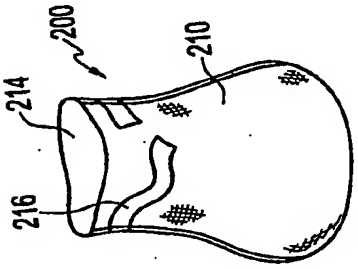

FIG. 9C

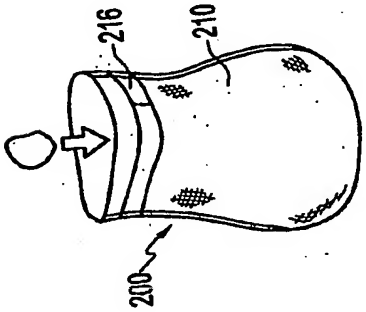

FIG. 9B

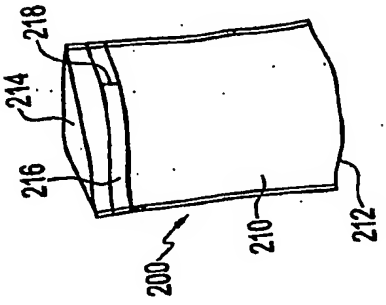

FIG. 9A